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AUTHORITY

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TECHNICAL MEMORANDUM NO. 71-03

AMBUSH LIGHT (PYROTECHNIC)

By

Joseph N. Ruff
Munitions Branch

August 1971

U. S. ARMY LAND WARFARE LABORATORY

Aberdeen Proving Ground, Maryland 21005

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Aberdeen Proving Ground, Maryland 21005

ABSTRACT

This memorandum summarizes the development of a pyrotechnic ambush light by the U. S. Army Land Warfare Laboratory. The light was developed to provide ambush teams with the capability for on-command, instant lighting of kill zones.

FOREWORD

The need for a small, lightweight, portable light source for illumination of ambush kill zones has been recognized by combat units engaged in night ambush operations.

Under LWL Task 02-F-70, a pyrotechnic ambush light was developed and tested, and two hundred units were shipped to Vietnam for evaluation.

Development work and fabrication of the RVN evaluation quantity was accomplished by MRC Corporation under Work Assignments 16 and 19 of Support of Research and Development of Munitions Contract DAAD05-68-C-0253.

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INTRODUCTION

Combat troops engaged in night ambush operations have a requirement for a small, lightweight, portable, easily deployed, disposable light source capable of providing instant light in conjunction with the initiation of the ambush.

One of the essential requirements for a successful ambush is the element of complete surprise. During night ambushes, success is enhanced if the surprise element is combined with simultaneous illumination of the kill zone to permit the troops initiating the ambush to effectively use individual point fire weapons in conjunction with preplaced, fixed-area-of-coverage mines generally used.

The inherent characteristics of the pyrotechnic type light indicate that it will satisfy ambush team requirements.

CONCLUSIONS

The Ambush Light (Pyrotechnic) is a safe, reliable item having successfully passed the Design Engineering (Safety Evaluation) Tests conducted by the Materiel Test Directorate of the U. S. Army Test and Evaluation Command.

The suitability and acceptability of the ambush light for combat operations will be determined after completion of the scheduled RVN evaluation.

GENERAL DESCRIPTION

The Ambush Light, Figure 1, is an electrically initiated pyrotechnic device intended for the illumination of ambush kill zones. The light source is a high-intensity pyrotechnic illumination candle contained in a collapsible, disposable, conical-shaped shield. A means of mounting the device on trees or bushes is incorporated in the design. The device is initiated by the M57 Electrical Firing Device (M18A1 APERS Mine Firing Device) through 100 feet of firing lead wire; full illumination is attained in approximately one-half second after actuation of the firing device. One minute of illumination at 125,000 candlepower is provided. When set up for use, the device is 14 inches long and 12 inches in diameter. Each Ambush Light is packed in a carrying case which may be carried by hand or slung over the shoulder. Total weight of the device, including firing device, lead wire, and carrying case, is 4-1/2 pounds. The device consists of three main components, a light shield assembly, illumination assembly, and the firing device with lead wire.

DESCRIPTION OF COMPONENTS

1. Light Shield Assembly

The Light Shield, Figure 2, is made of 40 mil aluminum-foil-faced asbestos cloth supported by five 1/8-inch diameter ribs which are hinged to a shield tube. The shield ribs are formed in a manner that provides a camming action which drives the ribs into the erect position when the illumination assembly is inserted into the shield tube.

2. Illumination Assembly

The Illumination Assembly, Figure 2, consists of two M127A1 Signal, Ground, White Star Candles, which are arranged to burn sequentially, and an Atlas M100 Electric Match. The candle is spring-loaded in a tube to provide a constant flame front in relation to the light shield as the candle length decreases during the burn. A firing lead connector with shunting cover attached is located at the rear of the assembly. An integral mounting screw is provided to expedite mounting of the light on trees, bushes, etc.

3. Firing Device and Lead Wire

The M57 Electrical Firing Device (M18A1 APERS Mine Firing Device), Figure 2, is used to initiate the Ambush Light. One hundred feet of firing lead wire, equipped with a shunted plug at each end, Figure 2, is provided.

SEQUENCE OF DEVELOPMENT

When LWL Task 02-F-70, Ambush Light (Pyrotechnic) was established, the intent was to use a candle being developed for Task 10-F-69, Bright Light Mob Dispersal (RC). However, after the Bright Light Candle was developed, comparison tests using this candle and other less expensive off-the-shelf candles were conducted. These comparison tests resulted in the decision to use the Signal, Ground, White Star, M127A1 Candle. Two of these candles would be arranged to burn sequentially to provide a burn time of one minute.

Work Assignment 16 of Support of Research and Development of Munitions Contract DAAD05-68-C-0253 with MRC Corporation, Baltimore, Maryland, was initiated to develop the Ambush Light and produce 100 units for Engineering Testing (Safety Evaluation). Work Assignment 19, for fabrication of 200 units for RVN evaluation, was initiated prior to completion of the 100 units for Safety Evaluation so that manufacture of certain basic components could be expedited. When these basic components were fabricated, work was halted pending completion of Safety Evaluation Testing.

Upon completion of the 100 test units, an Engineering Design (Safety Evaluation) Test was conducted by USATECOM. The report of this test is contained in Appendix A. The testing proved the Ambush Light to be safe to handle,

transport and use, but a high malfunction rate was noted. Consequently, design modifications addressing the malfunction problem were made. These modifications consisted of changing the ignition mix formulation and providing for more rapid venting of the candle on ignition.

Sixty-six single candle units incorporating the corrective design modifications were fabricated and tested by MRC Corporation. All the units functioned properly during these tests. See Appendix B.

The USATECOM tests and the Instruction Manual were reviewed by the USALWL Safety Statement Committee and the USALWL Safety Statement was issued. See Appendix C.

Fabrication of the 200 RVN evaluation units, incorporating the corrective design changes, was continued to completion. These 200 units, along with the Instruction Manual, Appendix D, were shipped to RVN in June 1971.

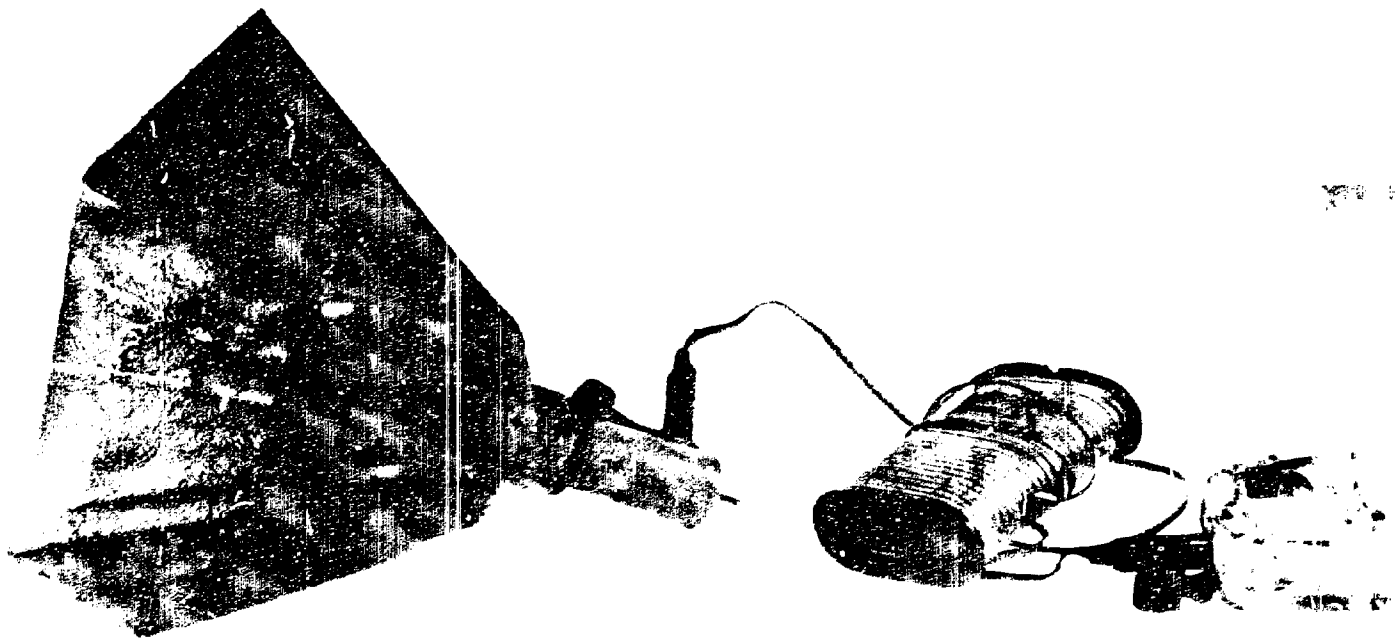

Figure 1. AMBUSH LIGHT (PYROTECHNIC)

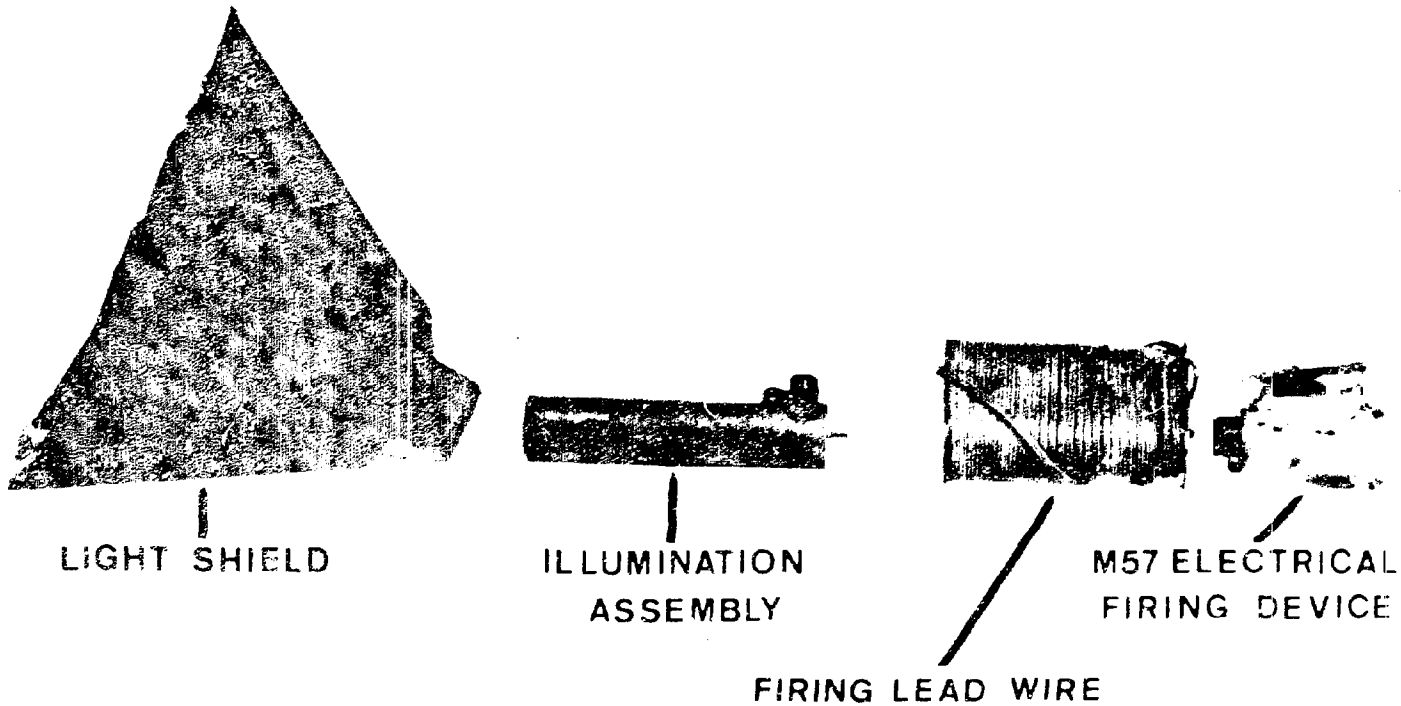

Figure 2. AMBUSH LIGHT (PYROTECHNIC) COMPONENTS

APPENDIX A

DEPARTMENT OF THE ARMY LOveroay/pad/234-3350-2935
ABERDEEN PROVING GROUND
ABERDEEN PROVING GROUND, MARYLAND 21005

8 FEB 1971

STEAP-MT-TI

SUBJECT: Final Letter Report of Engineer Design Test of Ambush Light (Pyrotechnic), USATECOM Project No. 8-MU-009-PAL-001

Commanding Officer
US Army Land Warfare Laboratory
ATTN: CRDLWL-8C

1. REFERENCES:

a. Letter, AMSTE-BC, 1 Jun 70, Subject: Ambush Light (Pyrotechnic), LWL Task 02-F-70, USATECOM Project No. 8-MU-009-PAL-001.

b. Letter, CRDLWL-8C, 22 May 70, Subject: Ambush Light (Pyrotechnic), LWL Task 02-F-70.

c. Instruction Manual, Nov 70, Ambush Light (Pyrotechnic), US Army Land Warfare Laboratory.

2. BACKGROUND:

a. An illumination device is required to provide combat forces in RVN with the capability of quickly illuminating the kill zone in an ambush. The device must be small, lightweight, easily-deployed, disposable, and capable of providing instant light in conjunction with the initiation of the ambush. The Land Warfare Laboratory has developed the Ambush Light (Pyrotechnic) to satisfy this requirement.

b. The ambush light is an electrically initiated pyrotechnic device. It consists of a collapsible light-directing shield, a pyrotechnic illumination assembly and an initiation system (Figure 1, Inclosure 2). The light shield is made of 40-mil foil-faced asbestos cloth in a 5-sided truncated pyramidal shape and is approximately 10 inches long and 12 inches across the open end. The illumination assembly is composed of two M127A1 ground signal candles (white star pyrotechnic) which are arranged to burn sequentially, and an Atlas M100 electrical initiator. The illumination assembly provides 50,000 candlepower for approximately 1 minute. The base end of the illumination assembly has an integral mounting screw which enables the light

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STEAP-MT-TI
SUBJECT: Final Letter Report of Engineer Design Test of Ambush Light (Pyrotechnic), USATECOM Project No. 8-MU-009-PAL-001

to be mounted on trees or bushes. The initiation system consists of an M57 electrical firing device and 100 feet of firing lead wire (Claymore mine type). The illumination assembly is stowed inside the collapsed light shield during shipment and storage prior to use. The ambush lights, in individual waterproof packages, are packaged two per standard M2A1 ammunition can. The ambush light is assembled by removing the illumination assembly from the collapsed light shield and inserting the front of the illumination assembly into the rear of the light shield. The assembled light can then be mounted on a tree or bush by the integral mounting screw. The lead wire plugs into the candle assembly which is functioned by the M57 firing device.

c. The purpose of this test was primarily to evaluate the safety aspects of the Ambush Light. Testing consisted of a rough handling test, 40-foot drop, bullet impact test, and a control firing. The test was conducted during the period 30 November 1970 through 29 January 1971.

3. OBJECTIVE:

The test objective was to provide the USALWL with a safety evaluation and limited operational data for the test item.

4. SUMMARY OF RESULTS:

a. Rough Handling Test - Thirty-two ambush lights were subjected to a rough handling test as illustrated in the flow chart, Figure 2, Inclosure 2. The test was conducted in accordance with MTP 4-2-602. No obvious damage occurred that could affect the functional performance of the ambush light.

b. Forty-Foot Drop Test - Four boxes, each containing four ambush lights, were subjected to a 40-foot drop test in accordance with MTP 4-2-601. The post-drop inspection revealed no indication of functioning. The lights were destroyed after test.

c. Bullet Impact Test - Five M2A1 cans, each containing two ambush lights, were impacted by 7.62mm projectiles from a distance of 100 feet. Three cans were impacted by M62 tracer projectiles and two cans by M80 ball projectiles. Two lights in individual waterproof carrying cases were impacted by M62 tracers. The eight ambush lights impacted by M62 tracer rounds ignited (Figures 3 and 4, Inclosure 2). The lid of one

8

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SUBJECT: Final Letter Report of Engineer Design Test of Ambush Light (Pyrotechnic), USATECOM Project No. 8-MU-009-PAL-001

M2A1 can was expelled 20 feet (Figure 5, Inclosure 2). The M80 ball projectiles did not ignite the ambush lights (Figure 6, Inclosure 2).

d. Functional Performance Test - Sixty-four ambush lights were assembled and functioned according to the instruction manual provided by the USALWL. Time from actuation of the M57 firing device to candle ignition, total burn time, general condition of the light after burnout, and other data that were pertinent to the handling and use of the light were recorded.

For test purposes the ambush lights were mounted on a wooden sawhorse by the integral mounting screw; several lights were also mounted on trees and telephone poles to check the effectiveness of the screw.

Eighteen of the lights were duds; 11 of 32 from the rough handling test and 7 of 32 untested. One dud was caused by an electric initiator failure; on all the others, the initiator functioned, but the candle failed to ignite.

The average burning time for the 46 lights which functioned was 56.5 seconds; the range of times was from 50.05 seconds to 65.80 seconds. For practical purposes, the candles ignited instantaneously; the average measured delay time was 0.35 second.

The ambush lights were easily mounted on the trees and telephone poles by the integral mounting screw.

The round-by-round results are listed in tables 1 and 2 of Inclosure 1.

5. CONCLUSIONS:

It is concluded that:

a. The ambush light can safely withstand the shocks and vibrations of rough handling.

b. The sensitivity of the ambush light to bullet impact is a fire hazard.

6. RECOMMENDATION:

It is recommended that the ambush light be considered safe to handle, transport, and fire with the following limitations:

8 FEB 1971

STEAP-MT-TI
SUBJECT: Final Letter Report of Engineer Design Test of Ambush Light (Pyrotechnic), USATECOM Project No. 8-MU-009-PAL-001

a. The user be informed of the potential hazards resulting from bullet impact of the ambush light.

b. The instruction manual for the ambush light be available for the user.

FOR THE COMMANDER:

R. P. WITT
Associate Director
Materiel Testing Directorate

2 Incl
1. Round-by-Round Data Tables
2. Photographs and Figures

CF:
CG, USATECOM, ATTN: AMSTE-BC (2 cys)

TABLE I - ROUND-BY-ROUND FUNCTIONING DATA, ROUGH HANDLING TEST ITEMS

Rd. No.	Previous[a] Conditioning	Ignition Delay Time, second	Total Burn Time, seconds	General Condition at Burnout and/or Remarks	Photo Figure Number, Incl
1	ABC	.35	61.50	Normal	11
2	ABC	.40	62.45	Normal	11
3	ABC	.40	57.25	Normal	11
4	ABC	.40	61.45	Normal	11
5	AB	.45	58.10	Normal	11
6	AB	.35	61.70	Light shield split at seam	10
7	ABC	.40	58.05	Normal	11
8	ABC	Dud		First fire ignited, but candles did not burn	7
9	A	.40	56.60	Normal	11
10	A	.24	54.50	Normal	11
11	A	.24	57.50	Normal	11
12	A	.28	56.40	Normal	11
13	ABC	.24	52.40	Normal	11
14	ABC	.24	56.75	Normal	11
15	ABC	.40	54.80	Normal	11
16	ABC	.20	56.00	Normal	11
17	DEF	.26	61.60	Normal	11
18	DEF	Dud		First fire ignited, but candles did not burn	7
19	DEF	Dud		First fire ignited, but candles did not burn	7
20	DEF	Dud		First fire ignited, but candles did not burn	7
21	DEF	.40	57.75	Normal	11
22	DEF	Dud		First fire ignited, but candles did not burn	7
23	DE	Dud		First fire ignited, but candles did not burn	7
24	DE	Dud		Electric initiator did not function	-
25	DEF	Dud		First fire ignited, but candles did not burn	7
26	DEF	Dud		First fire ignited, but candles did not burn; also, light shield split at seam	7 and 10
27	DEF	.35	57.65	Normal	11
28	DEF	.22	60.70	Normal	11
29	D	Dud		First fire ignited, but candles did not burn	7
30	D	.22	58.15	Normal	11
31	D	Dud		First fire ignited, but candles did not burn; also, light shield split at seam	7 and 10
32	D	.27	54.65	Normal	11

Footnotes:

[a]Phases of the rough handling test to which the lights had been subjected before the functioning.

A - 7-foot packaged drop test at -50°F
B - Bounce test at -50°F
C - 5-foot unpackaged drop test at -50°F
D - 7-foot packaged drop test at +145°F
E - Bounce test at +145°F
F - 5-foot unpackaged drop test at +145°F.

NOTE: Date of test, 12 Jan 1971
Average temperature, 45°F
Average wind velocity, 12 mph with gusts to 25 mph.

TABLE II - ROUND-BY-ROUND FUNCTIONING DATA FOR PREVIOUSLY-UNTESTED ITEMS

d. o.	Ignition Delay Time, second	Total Burn Time, seconds	General Condition after Burnout and/or Remarks	Photo Figure Number, Incl 2
1	.25	57.25	Normal	11
2	Dud		First fire ignited, but candles did not burn; also, light shield folded back.	9
3	Dud		First fire ignited, but candles did not burn.	9
4	.38	60.35	Normal	11
5	.26	61.45	Normal	11
6	.25	54.20	Normal	11
7	Dud		First fire ignited and a small flame was noticeable for 96 seconds, but the candle did not ignite.	8
8	.28	61.50	Normal	11
9	.27	63.60	Normal	11
0	.29	65.80	Normal	11
1	.26	52.40	Light shield split at seam and part of a candle fell on the ground while burning.	10
2	Dud		First fire ignited, but candles did not burn.	7
3	.28	61.50	Normal	11
4	.28	57.70	Light shield split at seam.	10
5	.29	59.95	Normal	11
6	.26	57.30	Light shield split at seam.	10
7	.28	60.50	Normal	11
8	.27	55.40	Normal	11
9	.29	64.40	Normal	11
0	.27	56.85	Light shield split at seam.	10
1	Dud		First fire ignited, but candles did not burn; also, light shield folded back.	9
2	.30	50.05	Normal	11
3	.26	62.90	Normal	11
4	Dud		First fire ignited, but candles did not burn; also, light shield folded back.	9
5	.28	63.40	Normal	11
6	.26	54.00	Normal	11
7	Dud		The first candle lit, but was expelled 87 feet from the setup; the second candle did not ignite and remained in the item.	10

TABLE II - ROUND-BY-ROUND FUNCTIONING DATA FOR PREVIOUSLY-UNFIRED ITEM (Cont.)

Rd. No.	Ignition Delay Time, second	Total Burn Time, seconds	General Condition after Burnout and/or Remarks	Photo Figur Number, Incl
88	.28	59.35	Normal	11
89	.26	56.50	Normal	11
90	.29	60.50	Normal	11
91	.26	54.60	Normal	11
92	.30	64.80	Normal	11

NOTE: Date of test, 13 Jan 1971
Average temperature, 22°F
Average wind velocity, 5 mph with gusts to 10 mph.

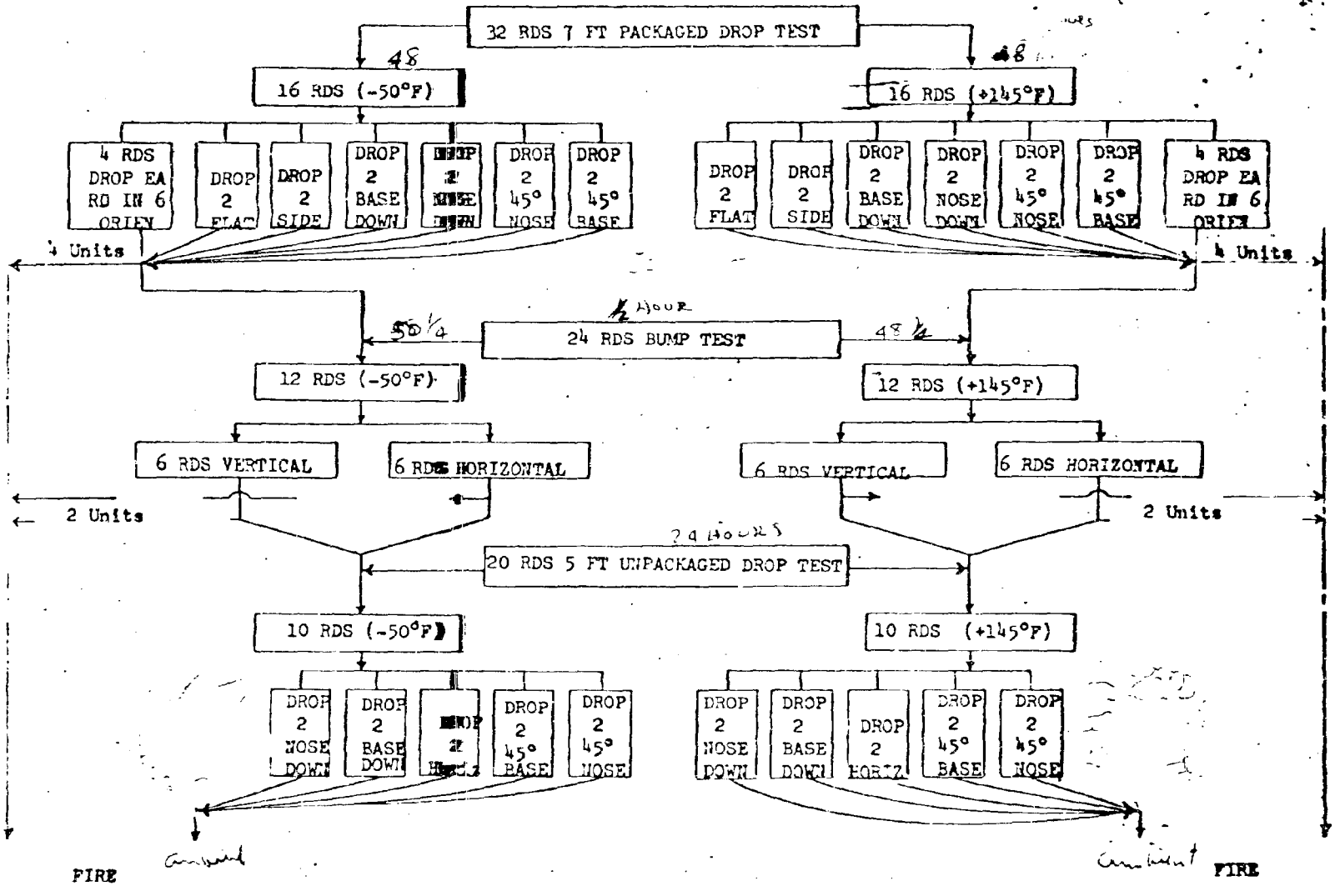

Figure 2: Rough Handling Outline

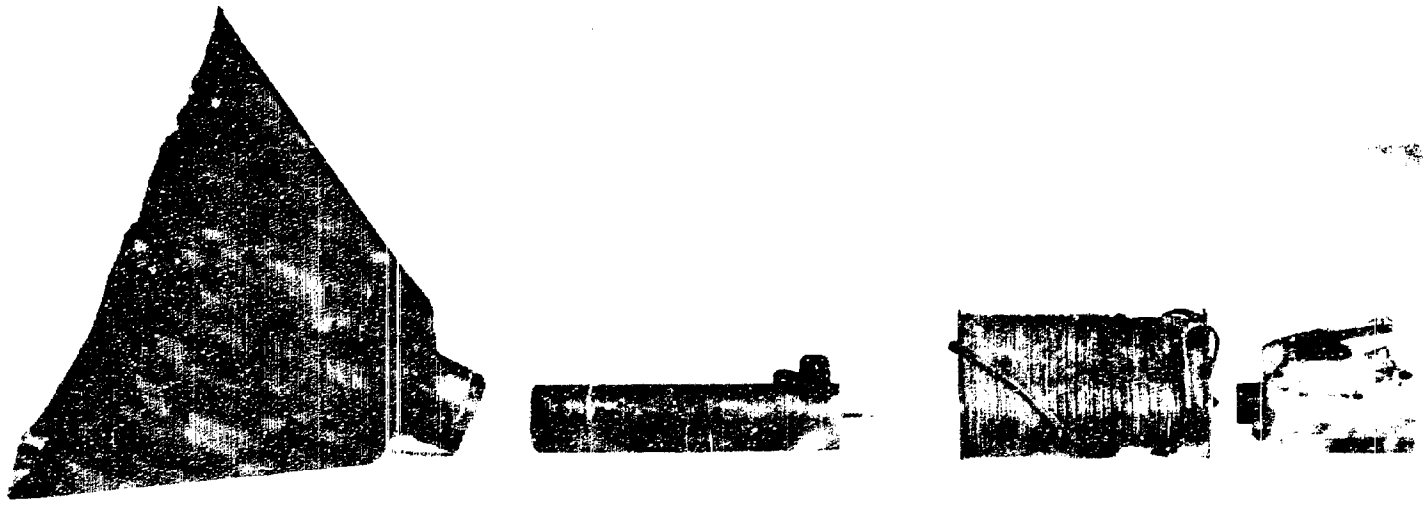

Figure 1: The ambush light.

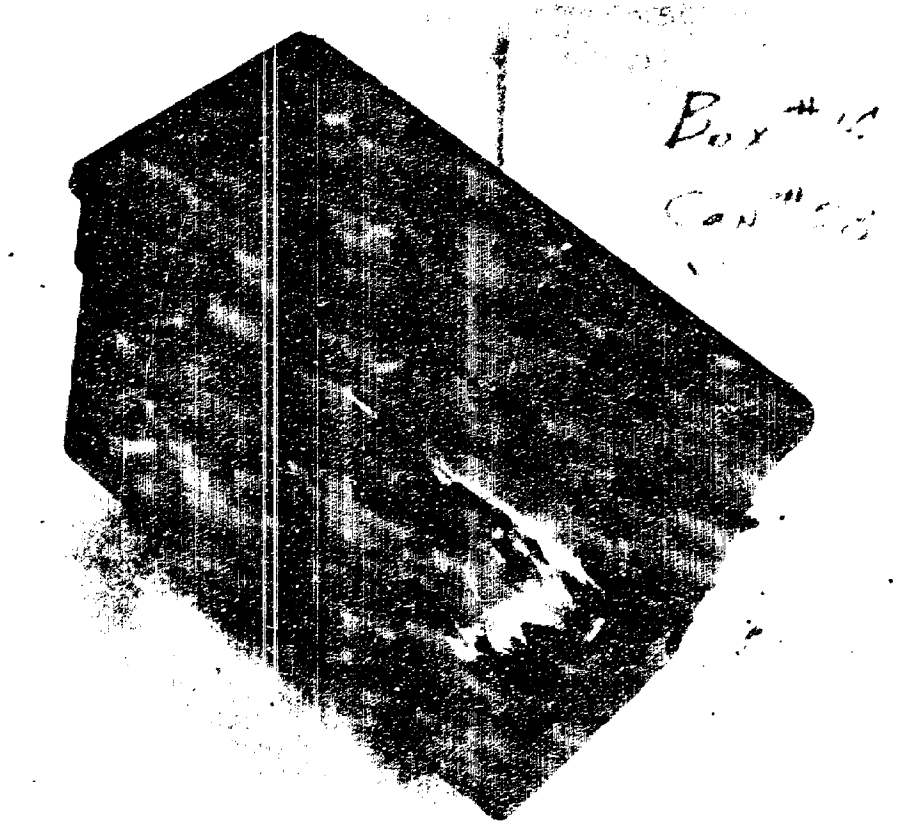

Figure 3: Result of 7.62mm Bullet Impact by M62 Tracer.

Figure 4: Result of 7.62mm Bullet Impact by M62 Tracer

Figure 5: Result of 7.62mm Bullet Impact by M62 Tracer (lid was expelled approximately 20 feet).

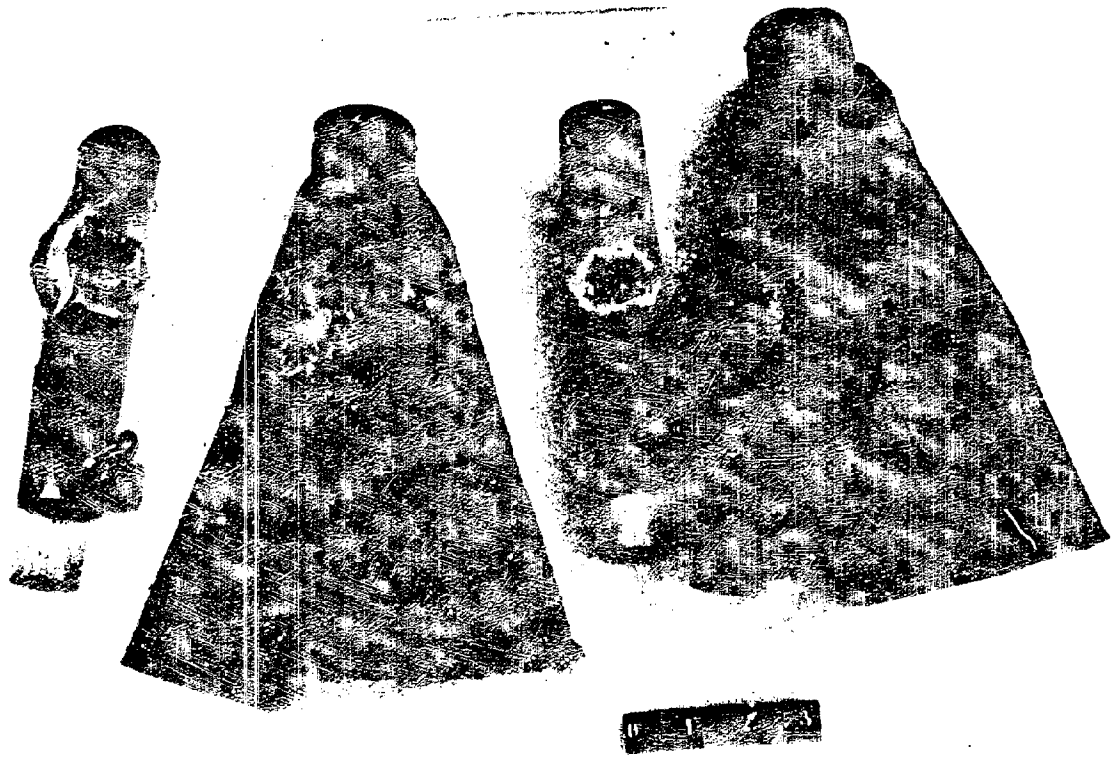

Figure 6: Result of 7.62mm Bullet Impact by M80 Ball.

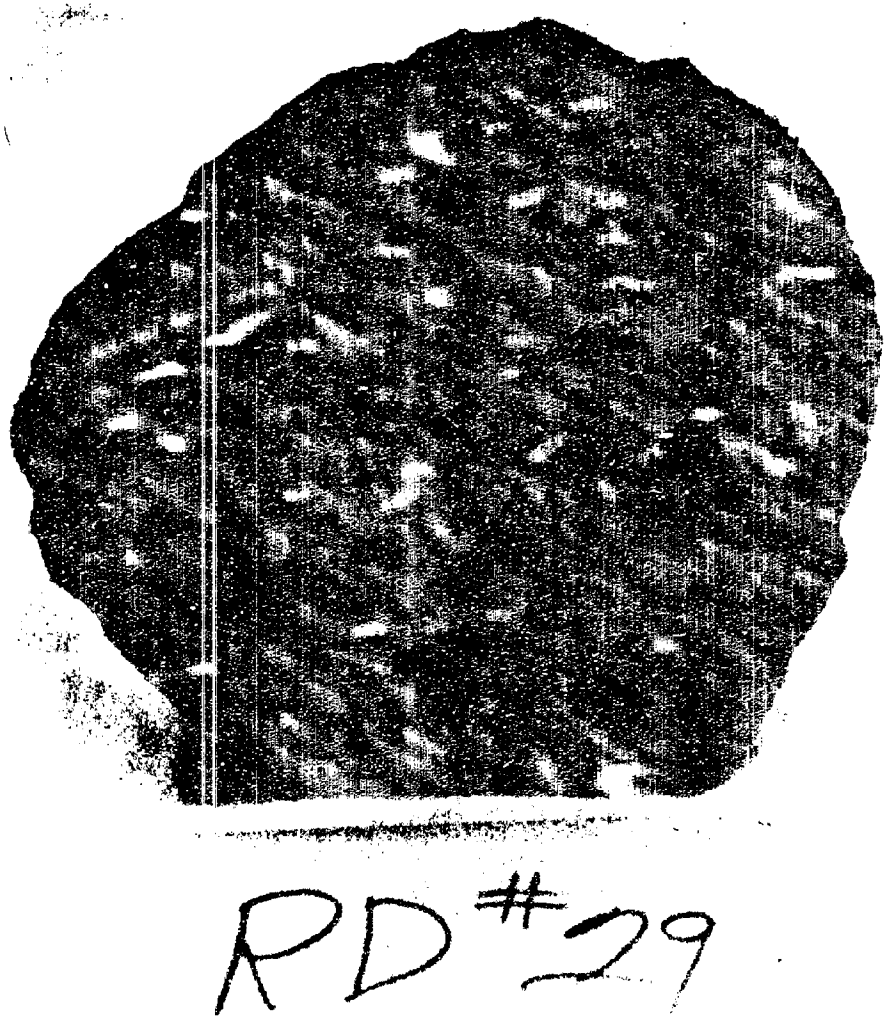

Figure 7: Typical round in which first fire charge ignited, but candles did not burn.

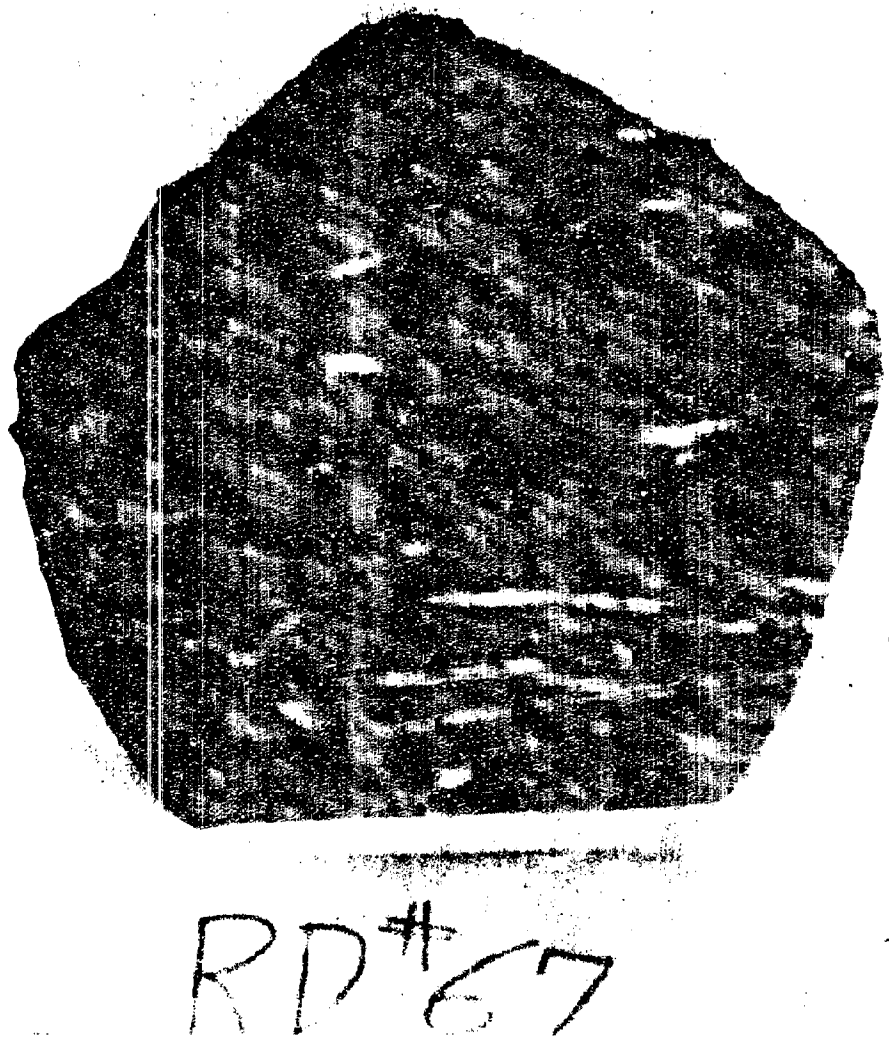

Figure 8: First fire charge ignited, but candles did not burn.

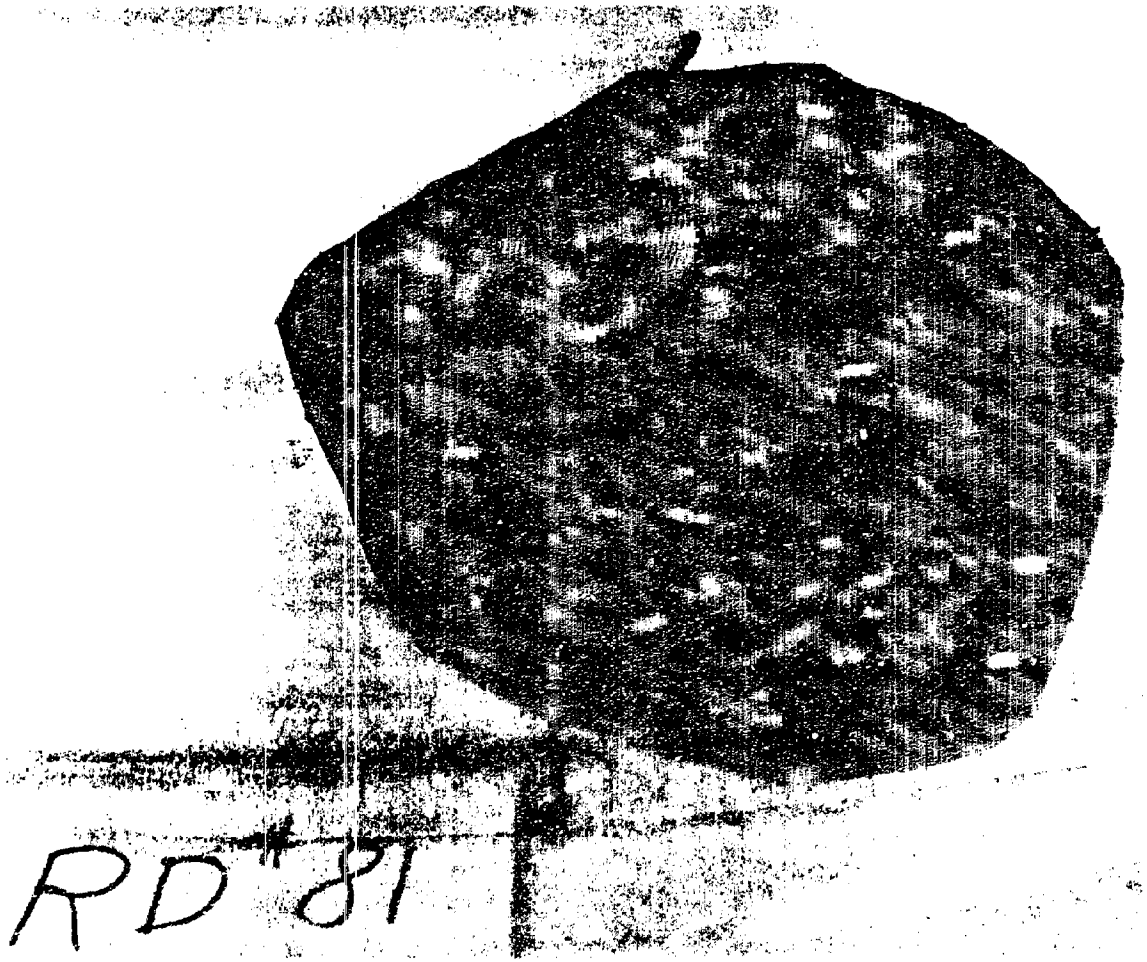

Figure 9: Typical round in which light shield was folded back after first fire charge ignited, but candles did not burn.

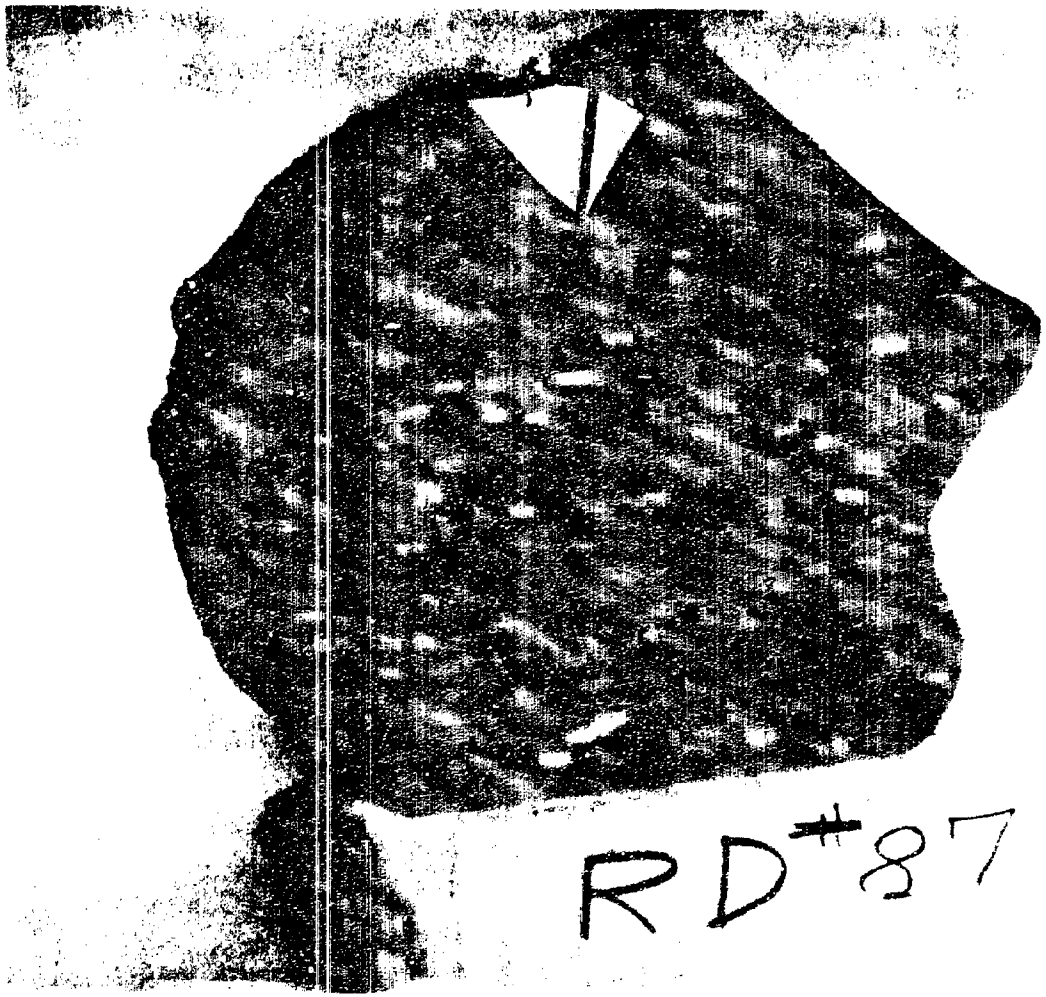

Figure 10: Typical example: First fire charge ignited, light shield split at seam, but candles did not burn.

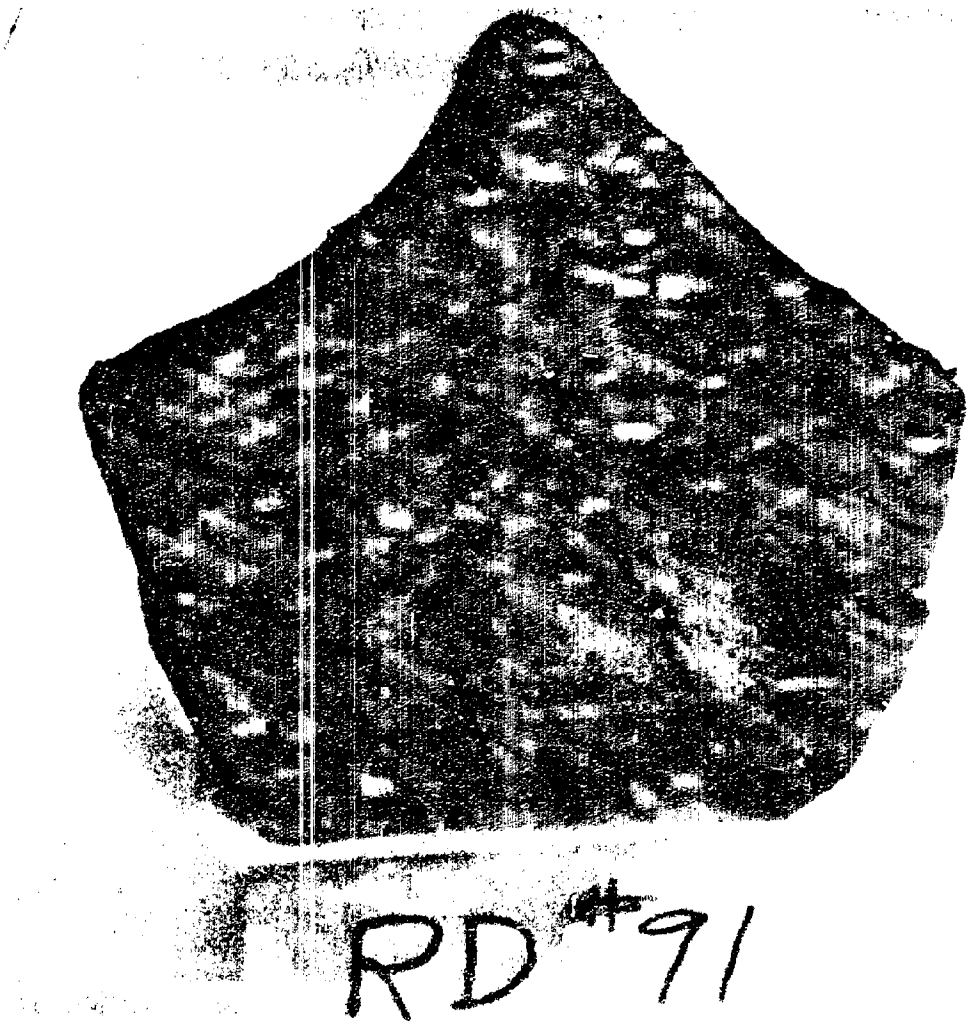

Figure 11: Typical normal round after burnout.

TABLE I

AMBUSH LIGHT - RELIABILITY TEST RESULTS

UNIT NO.	DATE TESTED	IGNITION ?	TEST CONDITIONING	IGNITION TIME (SECONDS)	BURNING TIME (NEAREST .5 SECONDS)
1	4/1/71	YES	1 Hour @ 145° F Conditioning, Fired at 110°- 120° F	NR	31
2	"	"		NR	29.5
3	"	"		.6	29.5
4	"	"		.7	27
5	"	"		.6	30.5
6	"	"		.7	31
7	"	"		.7	25
8	"	"		.5	26
9	"	"		.5	32
10	"	"		.8	31
11	"	"		.6	32
12	"	"		.7	30
13	"	"		.5	26
14	"	"		.4	28
15	"	"		.6	31
16	"	"	Ambient Control Lot	.6	29
17	"	"		.4	27
18	"	"		.7	32
19	"	"		.6	32
20	"	"		.7	31

SUMMARY:	NO. SUCCESSES	NO. FAILURES	AVERAGE IGNITION TIME (SECONDS)	AVERAGE BURN TIME (SECONDS)
Conditioned	15	0	.6	29.3
Control	5	0	.6	30.3
Total	20	0	.6	29.5

TABLE II

AMBUSH LIGHT - RELIABILITY TEST RESULTS

UNIT NO.	DATE TESTED	IGNITION ?	TEST CONDITIONING	IGNITION TIME (SECONDS)	BURNING TIME (NEAREST .5 SECONDS)
1	4/2/71	YES		NR	30.5
2	"	"		.4	31
3	"	"		.3	32
4	"	"		.4	30
5	"	"	1 Hour @ 145° F	.6	26.5
6	"	"	Conditioning	.5	25.5
7	"	"	Vibrated for 30 minutes	.5	29.5
8	"	"	Fired at 110° - 120° F	.5	28
9	"	"		.3	NR
10	"	"		.8	28
11	"	"		.4	25.5
12	"	"		.4	28
13	"	"		.5	31.5
14	"	"		.6	31.5
15	"	"		.7	28
16	"	"	Ambient Control Lot	NR	34
17	"	"		.6	27.5
18	"	"		.7	31
19	"	"		.5	31.5
40*	"	"		.9	32

* Failed to ignite on first try due to a faulty connector - Successful ignition obtained after connector pin was replaced.

SUMMARY:	NO. SUCCESSES	NO. FAILURES	AVERAGE IGNITION TIME (SECONDS)	AVERAGE BURN TIME (SECONDS)
Conditioned	15	0	.5	29
Control	5	0	.7	31
Total	20	0	.5	29.5

TABLE III

AMBUSH LIGHT - RELIABILITY TEST RESULTS

UNIT NO.	DATE TESTED	IGNITION ?	TEST CONDITIONING	IGNITION TIME (SECONDS)	BURNING TIME (NEAREST .5 SECONDS)
41	4/8/71	YES	24 Hours at -75° F Conditioning Fired at Approximately 32° F	.3	30
42	"	"		.3	30
43	"	"		.3	28
44*	"	"		.9	32
45	"	"		.2	29
46	"	"		.6	33
47	"	"		.2	32.5
48	"	"		.6	28
49	"	"		.8	32
50	"	"		.7	31.5
51	"	"		.5	30
52	"	"		.9	31
53	"	"		.5	32
54	"	"		.7	35
55	"	"		.7	31.5
56	"	"		.6	30
57	"	"		.3	28.5
58*	"	"		.6	28
59	"	"		.5	34
60	"	"		.4	30
61	"	"	Ambient Control Lot	.5	33
62	"	"		.6	31
63	"	"		.2	32
64	"	"		.5	30
65	"	"		.6	31
66	"	"		NR	30

* Failed to ignite on first try due to faulty connector. By checking line resistance while "giggling" the connector, it was possible to obtain a satisfactory circuit - both units functioned properly once the open circuit was alleviated.

SUMMARY:	NO. SUCCESSES	NO. FAILURES	AVERAGE IGNITION TIME (SECONDS)	AVERAGE BURN TIME (SECONDS)
Conditioned	20	0	.5	31
Control	6	0	.5	31
Total	26	0	.5	31

APPENDIX C

DEPARTMENT OF THE ARMY
U. S. ARMY LAND WARFARE LABORATORY
ABERDEEN PROVING GROUND, MARYLAND 21005

6 MAY 1971

CRDLWL -8

SUBJECT: Safety Statement

The United States Army Land Warfare Laboratory, Aberdeen Proving Ground, Maryland, hereby certifies that the item described below meets the Safety Statement requirements in consonance with the Laboratory's mission and is hereby released for test purposes to other than LWL personnel. The issuance of this Statement does not preclude the use of good judgment and judicious use of all standard safety procedures outlined in the Instruction Manual for Ambush Light (Pyrotechnic) and other appropriate safety regulations.

(Item) Ambush Light (Pyrotechnic)

Description

The Ambush Light (Pyrotechnic) is an electrically initiated pyrotechnic device. The light is contained in a collapsible and disposable conical shaped light shield and incorporates a means for mounting on trees or bushes. The light is initiated by the M57 firing device (M18A1 APERS Mine Firing Device) through 100 feet of firing lead wire; full illumination is attained approximately one-half second after actuation of the firing device. When set up for use, the light is approximately 14 inches long and 12 inches in diameter. The light consists of three main components, a light shield assembly, illumination assembly, and an initiation system.

Richard L. Clarkson

RICHARD L. CLARKSON
Colonel, GS
Commanding

APPENDIX D

INSTRUCTION MANUAL

FOR

AMBUSH LIGHT (PYROTECHNIC)

November 1970

U. S. ARMY LAND WARFARE LABORATORY

Aberdeen Proving Ground, Maryland 21005

EVALUATION QUESTIONNAIRE
(Ambush Light (Pyrotechnic))

U. S. Army Land Warfare Laboratory
Aberdeen Proving Ground, Maryland 21005

1. Was the unit damaged in shipment? Yes No
   Remarks: _____

2. Is Instruction Manual complete and easy to understand? Yes No
   Remarks: _____

3. Was the light easy to carry? Yes No
   Remarks: _____

4. Was the light carried to the site in the carrying case? Yes No
   If no, why not? _____

5. Was any difficulty encountered during assembly and mounting of the light? Yes No
   Remarks: _____

6. Did any precipitation occur during the time light was set up for use? Yes No
   If yes, number of hours of precipitation: _____
   Precipitation intensity: Light Moderate Heavy

7. Did light function properly? Yes No
   Remarks: _____

8. Was light output adequate for mission accomplishment? Yes No
   Remarks: _____

9. Did the smoke from the burning light create a problem? Yes No
   Remarks: _____

10. For what period of time was illumination required? _____

11. If illumination was required for more than one minute, was any difficulty experienced in maintaining continuous light? Yes No
    Remarks: _____

12. If light malfunctioned, explain: _____

13. Your comments or suggestions regarding the light's usefulness and desirability:

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LIST OF ILLUSTRATIONS

CHAPTER 1

PURPOSE AND SCOPE

1. PURPOSE

This manual contains the operating instructions for the Ambush Light (Pyrotechnic). It is to be used by all personnel using the Ambush Light.

2. SCOPE

a. Chapter 2, Description, supplies a description of the Ambush Light, its packaging, and general data.

b. Chapter 3, Assembly, Installation and Operation, contains assembly procedures and installation and operation instructions.

c. Chapter 4, Safety Precautions, contains the safety precautions to be observed when using the Ambush Light.

3. REPORTS

Suggestions for improvement of the design of the Ambush Light should be transmitted through proper channels to the Commanding Officer, U. S. Army Land Warfare Laboratory, Aberdeen Proving Ground, Maryland 21005.

CHAPTER 2

DESCRIPTION

4. GENERAL DESCRIPTION

The Ambush Light, Figure 1, is an electrically initiated pyrotechnic device designed for the illumination of ambush kill zones. The light is contained in a collapsible and disposable conical-shaped light shield and incorporates a means for mounting on trees or bushes. The light is initiated by the M57 firing device (M18A1 APERS Mine Firing Device) through 100 feet of firing lead wire; full illumination is attained approximately one-half second after actuation of the firing device. When set up for use, the light is approximately 14 inches long and 12 inches in diameter. The light consists of three main components, a light shield assembly, illumination assembly, and an initiation system.

5. DETAILED DESCRIPTION

a. Light Shield Assembly

The Light Shield, Figure 2, is made of heat-resistant cloth supported by five ribs which are hinged to a shield tube The shield ribs are formed in a manner

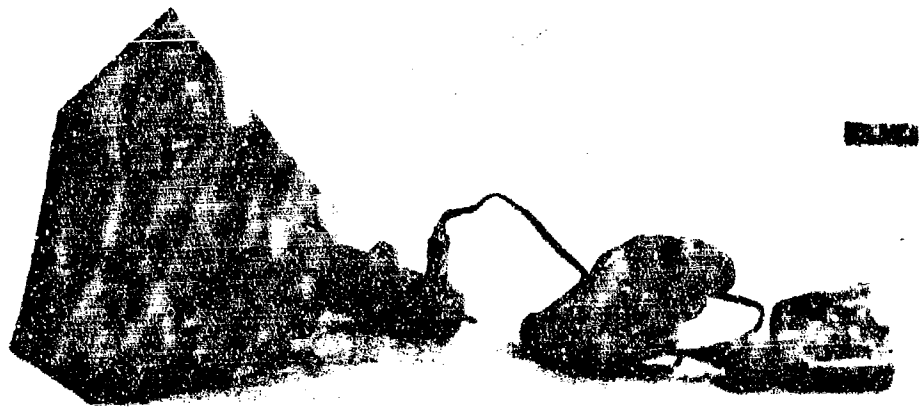

Figure 1. Ambush Light (Pyrotechnic)

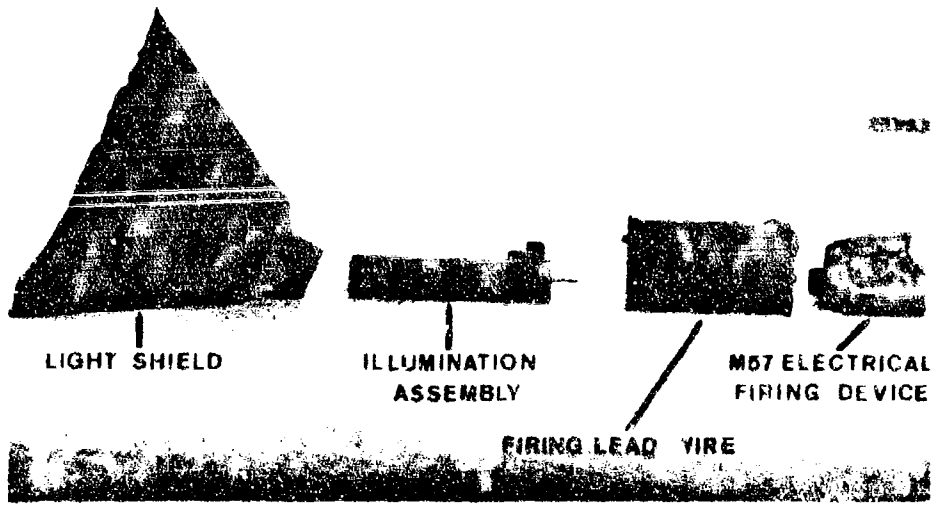

Figure 2. Ambush Light Components

that provides a camming action which drives the ribs into the erect position when the illumination assembly is inserted into the shield tube.

b. Illumination Assembly

The Illumination Assembly, Figure 2, consists of a pyrotechnic candle and an electrical initiator. The candle is spring-loaded in a tube to provide a constant flame front in relation to the light shield as the candle length decreases during the burn. A firing lead connector with shunting cover attached is located at the rear of the assembly. An integral mounting screw is provided to expedite mounting of the light on trees, bushes, etc.

c. Initiation System

The Initiation System, Figure 2, consists of an M57 electrical firing device and 100 feet of firing lead wire.

6. PACKAGING

Each light, complete with firing lead wire and M57 firing device, is individually packaged in a water-resistant carrying case, Figure 3, which is equipped with an adjustable strap that permits the light to be carried in the hand or slung over the shoulder. Before insertion in the carrying

Figure 3. Carrying Case

case, the illumination assembly, surrounded by the folded light shield assembly, is sealed in a vapor barrier bag and the initiation system is placed in a polystyrene half nest container. Two complete lights are packed per M2A1 Metal Ammunition Can, and two ammunition cans are overpacked with a wire-bound wooden box.

NOTE: The lights are to remain in the metal ammunition cans during storage prior to deployment.

7. GENERAL DATA

a. Weight (including carrying case): 4-1/2 pounds.

b. Size (carrying case): 2-3/4" X 6-3/4" X 11".

c. Size (set up for use): 14" long X 12" diameter.

d. Light Output: 125,000 candlepower.

e. Burn Time: 1 minute.

f. Initiation Time (to full illumination): approximately .5 seconds.

CHAPTER 3

ASSEMBLY, INSTALLATION AND OPERATION

8. ASSEMBLY

a. Remove the Carrying Case from the metal ammunition can (this would normally be performed prior to the start of a tactical operation, but if the units are to be cached, they should not be removed from the metal cans until just prior to use).

b. Remove the light components from the carrying case.

c. Remove the vapor barrier bag from the light shield/illumination assembly.

d. Remove the firing device and lead wire from the polystyrene half nest container.

e. Grasp unit in one hand near base of the shield tube, Figure 4.

f. Hold unit in vertical position with forward end of shield up and with the other hand grasp the ends of the shield ribs and in succession pivot open the ribs fully, Figure 5.

g. While holding the unit in the vertical position, grasp the illumination assembly near the base and remove it from the shield tube, Figure 6.

Figure 4. Holding Light for Assembly

Figure 5. Opening Shield Ribs

h. Inspect components for damage. If the illumination assembly tube is damaged (dented) or the end seal is not intact, discard the unit. If the mounting screw or the light shield ribs are bent or become bent during assembly or installation, simply grasp in the hands and reshape.

i. Rotate the shield assembly to the horizontal position and insert the front of the illumination assembly into the rear of the shield tube, being careful to align the key on the illumination assembly with the key slot in the shield tube, Figure 7. Insert illumination assembly into the shield tube until the illumination assembly key contacts the end of the shield assembly key slot. When the illumination assembly is fully seated, its front face will extend approximately 3/4 inch past the front face of the shield tube.

NOTE: If the light shield assembly ribs are not fully extended, it will be difficult to insert the illumination assembly into the shield tube without the use of undue additional force.

9. INSTALLATION

Although conditions at the employment site will dictate the installation method, it is recommended that the integral mounting

Figure 6. Removing Illumination Assembly From Shield

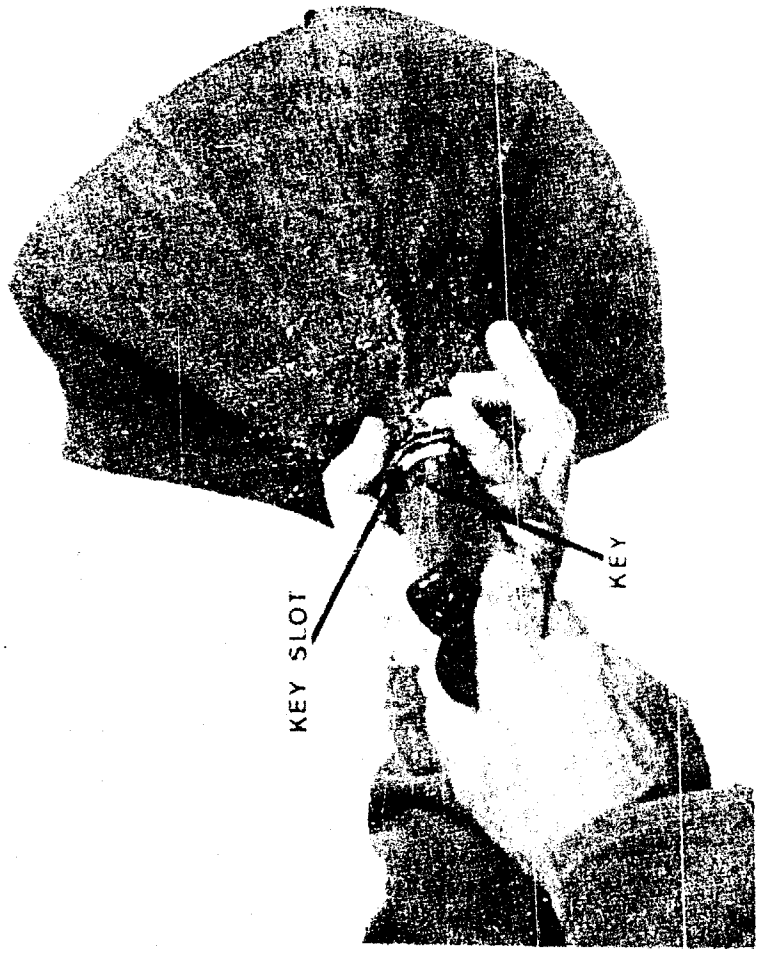

Figure 7. Installing Illumination Assembly in Shield Tube

screw provided be used whenever possible to attach the light to an opportune tree or bush. If the tree or bush selected is not large enough to accommodate the mounting screw, the strap from the carrying case may be used to lash the light to the smaller branches. If it is desired or necessary to mount the light on the ground, several small stakes or rocks may be used to hold the light in the desired position When an illumination period of more than one minute is required or a backup system is desired, place additional lights as required. To insure adequate lighting of the zone of action, the lights should be placed within a radius of 50 meters of the center of the zone.

a. Point the assembled light toward the center of the zone of action, grasp the base of the shield tube and rotate clockwise to engage the screw in the tree or bush selected.

b. Remove the shunting/dust cover from the illumination assembly firing lead connector.

c. Remove the dust cover from one end of the firing lead wire and plug wire into the illumination assembly connector.

d. Unspool the firing lead wire while proceeding to the command position.

e. Place M57 firing device safety bail in safe position, Figure 8, and remove connector dust cover.

f. Remove firing lead wire dust cover and plug wire into firing device.

10. OPERATION

a. Place the firing device safety bail in the armed position.

b. Squeeze firing device actuating handle sharply to initiate light.

c. When an illumination period of more than one minute is desired, initiate additional lights in sequence as required.

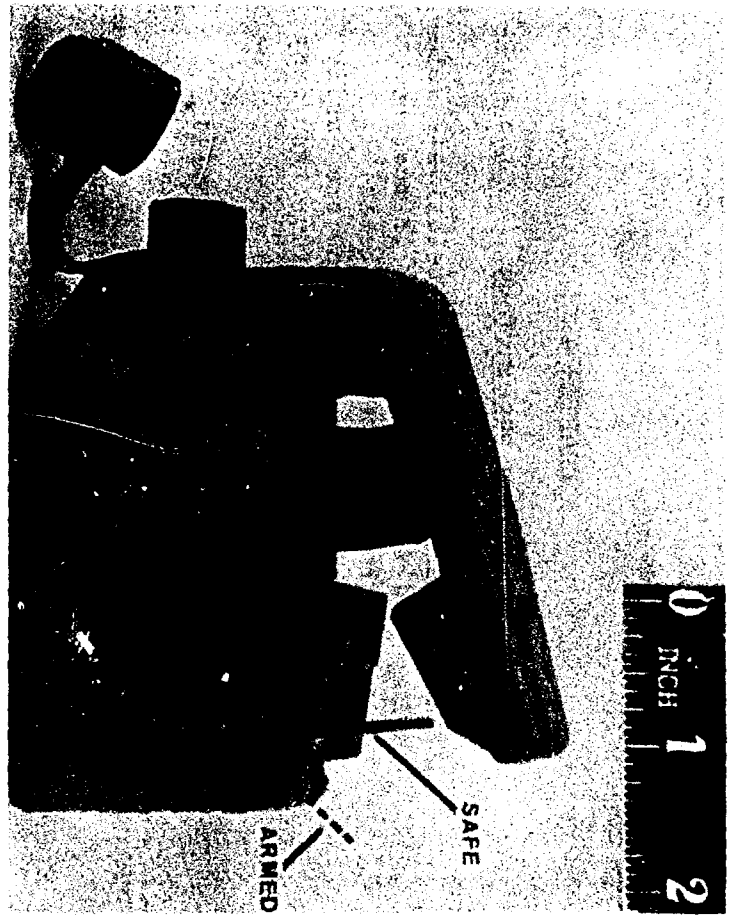

Figure 8. M57 Firing Device Safety Bail

CHAPTER 4

SAFETY PRECAUTIONS

Although the Ambush Light is relatively safe during handling and operation, it must be remembered that pyrotechnic material is hazardous. Because pyrotechnics are easily initiated, they are more dangerous than many types of ammunition.

a. A small arms bullet impact will normally ignite this device.

b. Ensure that friendly personnel are a minimum of 15 meters from the front of the light during initiation (burning ignition mix particles and a plastic ignition mix container are projected 2 to 4 meters forward).

c. If a light fails to initiate, wait three (3) minutes; then dispose of the light in accordance with existing procedures for disposal of pyrotechnics.

d. Unit should not be hand-held during burning.

e. Dispose of damaged components in accordance with EOD procedure (reference paragraph 8.h).

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13. ABSTRACT

This report summarizes the development of a pyrotechnic ambush light by the U. S. Army Land Warfare Laboratory. The light was developed to provide ambush teams with the capability for on-command instant lighting of kill zones.

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